

Validation of Brief Condom Use Attitudes Scales For Spanish Speaking People-who-use-drugs in El Salvador

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Abstract

Background

People-who-use-drugs (PWUDs) are a population severely impacted by a concentrated epidemic of HIV. Behavioral interventions to prevent and treat HIV among PWUDs have been implemented around the world including in low- and middle-income countries which have been disproportionately affected by HIV. However, few studies have been conducted with PWUDs to assess the validity and psychometric properties of measures that assess intervention effectiveness. Furthermore, there are very few measures that have been validated on transnational populations as most research interventions have utilized U.S. samples.

Methods

Our sample was comprised of 1,324 PWUDs, Spanish monolingual speakers, residing in the metropolitan area of San Salvador, El Salvador. Exploratory factor analysis and subsequent confirmatory factor analysis using SPSS and Amos were conducted on three abbreviated and translated condom use attitude measures (i.e., *Condom Use Attitudes Scale – Spanish Short Form*, *Condom Use Social Norms – Spanish Short Form*, *Condom Use Self-Efficacy – Spanish Short Form*). Convergent validity was examined using bivariate correlational analysis with actual condom use and STI infections.

Results

Results indicated that the two-factor, 8-item correlated model for the CUAS-SSF scale had an excellent fit with an adequate reliability ($\alpha = .764$). The confirmatory factor analysis for the 5-item, CUSN-SSF scale indicated a satisfactory fit with 3 of 6 fit indices indicating adequate fit. Analysis of the two-factor, 5-item CUSE-SSF scale indicated satisfactory fit with an adequate reliability ($\alpha = .844$). Bivariate analysis indicated correlations between all measures and with self-reported condom use.

Conclusions

Results indicated that these brief measures are valid and reliable and can be utilized to assess the effectiveness of HIV risk reduction interventions among Spanish speaking PWUDs.

Validation Of Brief Condom Use Attitudes Scales

Approximately 36.9 million individuals worldwide live with HIV with an estimated 1.8 million becoming newly infected in 2017 [1]. Approximately 47% of all HIV infections globally are among members from these four key populations: sex workers, transgender individuals, men-who-have-sex-with-men (MSM), and people-who-use-drugs (PWUDs), and their sexual partners [1]. Specifically, it is estimated that risk for

acquiring HIV is 27 times higher for MSM, 23 times higher for people who inject drugs, 13 times higher for female sex workers, and 12 times higher for transgender women than the general population [1]. Furthermore, a great proportion of concentrated epidemics, or sub-epidemics, occur in places such as Latin America among individuals from the abovementioned vulnerable populations [2].

HIV prevalence for the general population in Latin America is approximately 1% [2]. However, high HIV prevalence among many key populations in Latin America is a significant concern. Although surveillance data for sex workers, MSM, and transgender individuals has been consistently collected in Latin America and showed epidemic levels of HIV incidence [1, 3–6], very little data has been collected on PWUDs. Difficulties in estimating HIV prevalence for PWUDs has been well documented as very few countries collect official surveillance data on drug users [7]. For instance, it was estimated that only Brazil, Chile, Colombia, Mexico, Nicaragua, Paraguay, and Peru had formally collected information on HIV prevalence among PWUDs since 1987 [7]. This is especially problematic as recent surveillance data estimated that illegal drug consumption was approximately 4.8% higher in Latin American countries than the global average of 3.8% [8]. The limited information available indicates that Latin America had approximately 1,508,000 to 2,597,500 injection drug users of which 181,500 to 1,175,500 most likely were HIV positive [7] and Central American countries may bear the brunt of drug use incidence and prevalence. For example, a large study examined illicit drug use across multiple countries in Central America and found that actual use of crack or coca paste for adolescents in El Salvador was the highest at 8% compared to other countries [9]. A national survey around this same time period found that 1% of residents in San Salvador had consumed crack within the last 30 days [10]. However, crack use rates were higher (4.9%) among adolescents who were 18-years-old [10].

HIV prevalence for the general population in El Salvador is estimated to be 0.8% [11] [12]. However, multiple sources have indicated alarming, epidemic levels of HIV and other STDs in localized pockets of key populations. HIV and STD rates for MSM has been estimated to be between 7.7% and 15.5% [1, 13, 14] between 3.14% and 6% for sex workers [14, 15], and between 20.7% and 71.1% for transgender women [4, 14, 15]. As aforementioned, no official surveillance data reports on HIV/STDs prevalence among individuals who consume drugs in El Salvador exists; however, research studies estimated HIV prevalence in crack users to be between 4.9% to greater than 8% [16]. High levels of sexual risk factors/behaviors among crack users is what makes this population particularly vulnerable to contracting HIV [17] as crack use has been associated with higher numbers of sexual partners [18], increased impulsivity and sex drive [19], more barriers to acquiring healthcare and high levels of sexual assault and violence [20], and exchanging sex for drugs [21, 22]. As a result, there is an urgent need to design and implement interventions and assess their effectiveness using appropriately validated outcome measures within relevant cultural contexts.

Condom use is a primary outcome assessed in most HIV prevention interventions with up to 51% of research studies in developing countries measuring condom use as a primary outcome for intervention effectiveness [23]. This is the case because other forms of prevention such as pre-exposure prophylaxis is not readily available and uptake would need to increase by a greater amount to achieve the same amount

of effectiveness as condom use at the population-level [24]. Furthermore, consistent and correct use of condoms is the cheapest and most effective way to reduce HIV/STD transmission [25–29]. Moreover, much theory and subsequent research has hypothesized and found associations between attitudes, norms, and self-efficacy with intentions to use condoms, condom use frequency, and number of sexual partners [30, 31]. However, many evidence-based HIV interventions grounded in these theories have been designed and funded by the United States which has led to an implementation gap in other communities possibly due to lack of cultural considerations or political and economic issues [32–35] to assess intervention efficacy even though low- and middle-income countries bear most of the brunt of HIV and AIDS infections and deaths [36]. It is only recently that research on the effectiveness of HIV prevention interventions and psychometric properties of outcome measures has been conducted in transnational contexts. Consequently, the dearth of psychometric validation studies has led to limitations in assessing the effectiveness of HIV/STD interventions in non-US contexts.

The purpose of the present study is to investigate the construct validity of three brief condom use attitude scales among a large sample of Spanish mono-lingual speaking crack/cocaine users living in San Salvador. The validation of brief measures to assess HIV prevention effectiveness among a population that may exhibit some temporary cognitive interference or decline such as individuals who are actively using drugs is important. To assess construct validity we computed exploratory and confirmatory factor analyses and correlations. To our knowledge no measures currently exist that have been validated on Spanish-speaking PWUDs. This is concerning as Latin America has multiple pockets of key populations that have high rates of HIV/STDs. Because condoms are considered one of the most effective and affordable ways to reduce HIV transmission, it is important that interventions target and reliably assess condom use behaviors and attitudes.

Methods

Participants

Participants were 1,324 crack users (87% male; <1% transgender). Ages ranged from 18 to 70 with a mean of approximately 36 years old ($SD = 11.337$). Approximately 51% of the individuals indicated that they did not have a stable place to live. Average monthly wage was \$231 ($SD = 213.34$) with a range of \$2.50 and \$1,500. Approximately 71% had less than a 9th grade education. The average number of times within a 30-day period in which participants used crack was approximately 14 times ($SD = 23.214$). Table 1 presents other demographic characteristics.

Table 1
Descriptive Statistics (N= 1,324)

Variable	%	Frequencies
Cismale participants	87%	1,152
Homeless/Unstable place to live	51%	675
< 9th Grade Education	71%	940
Younger than 35 years old	49%	649
Monthly Wages <\$240	78%	1,033
Use crack at least seven days in the last 30	81%	1,072
Unemployed	51%	
Ever had an STI	44%	583
Living with HIV	2%	32
At least one sexual partner in last 30 days	81%	1,077
Heterosexual Orientation	88%	1170
Unsafe sexual practice at least once last 30 days	58%	767
<i>Table depicts percentage of participants who fit into each demographic category and the number of participants who fit into each category</i>		

Procedure

Participants in this study were Salvadoran national Spanish mono-lingual speakers who took part in a large HIV risk reduction study implemented in San Salvador, El Salvador. The intervention study was implemented between 2011 and 2016. Data for the present study is derived from the cross-sectional surveys which were administered at six time points to assess intervention effectiveness. Surveys included validated measures which were translated by a team of 3 bilingual researchers fluent in Spanish and Salvadoran national team members. The wording of scale items was adapted to make items more relevant to PWUDs in a different cultural context. Evaluation from Spanish-speaking experts in the field drove decision-making in which items to alter and retain. Participants were recruited via respondent-driven sampling (RDS) to answer the survey. In RDS, identified individuals from the community, or “seeds,” worked in conjunction with community partners to recruit participants [37]. To be eligible to be a seed, the participant had to meet inclusion criteria and be willing to provide a list of individuals in their social network who they believed to be at high-risk for acquiring HIV. These seeds subsequently were given coupons to handout to other potential participants to take part in the study [38]. To be eligible for the study, participants had to be at least 18 years of age, smoked crack in the last month, and be able to

provide informed consent. All surveys were administered face to face in a private location. All participants received \$5 for participating in the survey and \$2 for each participant they recruited. The Medical College of Wisconsin IRB approved the study.

Measures

Demographics. Participants were asked to self-report their age, gender, education, marital status, sexual orientation, income, and homelessness. Participants were also asked about frequency of crack use, number of sexual partners, condom use, number of sexually transmitted diseases ever acquired, and whether they had previously tested for HIV. Frequency of substance use and substance of choice was assessed by asking the participants to review a list of substances and indicate if they had ever used the substance (i.e., yes or no) and how often they had used in the last 30 days. Condom use was assessed by asking participants to respond to how often they had vaginal or anal sex without using a condom in the last 30 days. To assess whether participants had been diagnosed with sexually transmitted diseases, including HIV, participants were given a list of common STDs and asked to respond (i.e., yes or no) if they had ever been diagnosed with any of the STDs previously. Additionally, the participants were asked how often they had been diagnosed with STDs or the year in which they had been diagnosed with HIV.

Condom Attitudes Scale. An abbreviated 8-item version of The UCLA Multidimensional Condom Attitudes Scale was used to assess general attitudes towards condom use. A sample item is “Condoms are uncomfortable”. Responses were captured on a 4-point Likert type scale that ranged from 1 = ‘completely disagree’ to 4 = ‘completely agree’.

Condom Use Self-Efficacy. An abbreviated 6- item version of the NIMH Multisite Condom Use Self-Efficacy Scale (NIMH CUSES) was used to assess condom use self-efficacy [39]. A sample item is “I have confidence that I will talk to my sexual partner about HIV/AIDS even though I am under the influence of crack.” Responses were captured on a 4-point Likert type scale that ranged from 1 = ‘completely disagree’ to 4 = ‘completely agree’.

Condom Use Social Norms. Condom Use Social Norms was measured with a 7-item scale. Items were adapted from past research questions regarding condom use barriers and perceptions of safer sex peer norms [40]. A sample item is “my friends completely accept the use of condoms.” Responses were captured on a 4-point Likert type scale that ranged from 1 = ‘completely disagree’ to 4 = ‘completely agree’.

Data Analysis

Data analysis were conducted with statistical package for the social sciences (SPSS) v. 25 and Amos v. 25. As the condom use attitudes, self-efficacy, and norm scales were abbreviated, translated, and adapted to be used for PWUD, an exploratory factor analysis (EFA) was first performed to identify a data-driven

model of each scale followed by a confirmatory factor analysis (CFA) that was used to validate the structure identified in the exploratory factor analyses. To conduct EFAs and CFAs, we followed recommendations to split the data randomly into two datasets comprising approximately 50% of the cases per dataset [41]. Subsequently, three exploratory and confirmatory factor analyses were conducted separately for each of the scales. The CFA was used to confirm the hypothesized structure based on the initial EFAs. EFAs were conducted using the first half of the randomly split data (N = 643) and the CFAs were conducted using the second half (N = 681).

Prior to any statistical analysis, data were inspected for missing values and multivariate normality. Missing data was less than 5% which is within an acceptable range [42]. Missing values were replaced by the series mean as simulation studies have demonstrated that this procedure produces similar values to regression and expectation maximization techniques when missing values fall below the 5% threshold [42]. Assumptions of multivariate normality were assessed using kurtosis, skewness, scatterplots, and histograms. Skewness and kurtosis values for each scale at the scale-level fell within the acceptable range of +/-2 [43]. Additionally, skewness and kurtosis values at the item-level fell within the acceptable range of +/-2 in both datasets [43].

In EFAs, sample fit was identified using the Kaiser-Meyer-Olkin method and the Bartlett sphericity test [44]. A KMO value above .70 was considered acceptable [45]. Furthermore, to determine the number of factors in EFAs, we used multiple criteria, which included Kaiser's Rule, inspection of the Scree Plot, interpretability of the pattern of loadings, simple structure, and amount of variance explained [46–49]. The factor matrix was evaluated to determine the number of items retained on each factor and thereby the interpretability of the factors [47]. The criteria of .32 and a difference of at least .17 between cross-loading items were utilized to determine the item selection for each factor [50]. Lastly, to rotate factors during EFAs, we employed an oblique rotation method (i.e., promax) as it has significant advantages over an orthogonal rotation, and previous literature and theory suggest that factors can be correlated and multidimensional [51].

We employed Maximum Likelihood (ML) estimation for all exploratory factor analysis as data was determined to be normally distributed. ML has the added benefit of yielding a wider range of fit indices [51] and allows for factors to be correlated [52]. To determine model fit in the CFAs, a mixture of integral and absolute model fit indices and respective criteria were chosen. Values greater than .90 in the comparative fit index (CFI), the Tucker-Lewis model index (TLI), and the goodness-of-fit index (GFI) and values below .08 for the standardized root-mean-square residual (SRMR) and the root-mean-square error of approximation (RMSEA) indicate good fit [53–54]. Results of the EFAs followed by the CFAs by scale are presented below.

Results

Condom Use Attitudes Scale – Spanish Short Form (CUAS – SSF). The Kaiser-Meyer-Olkin method (.821) and the Bartlett sphericity test ($p < .001$) indicated adequate sample size and fit. Kaiser's rule, the scree plot, and pattern of loadings indicated a two-factor structure which explained approximately 37% of the

variance. Results also indicated that 7 of the original 8 items loaded onto factors except for the item: “los condones no son seguros” (“condoms are unreliable”). Consequently, this item was dropped and the analysis was repeated with the remaining 7 items. Kaiser-Meyer-Olkin method (.808) and Barlett sphericity test ($p < .001$) indicated the sample fit and size were satisfactory. The second iteration demonstrated an increase in the amount of variance explained (40%) and demonstrated a simple two-factor structure. All items had factor loadings above .32 and had cross loadings that were at least .17 in difference. Items 1, 2, 4, and 6 loaded onto Factor 1 which we labeled “general attitudes towards condom use”. Items 3, 5, and 8 all loaded onto Factor 2 which we labeled “attitudes towards condom use with partners”. The factor correlation matrix indicated a moderate correlation between the two factors (.625). Cronbach’s Alpha indicated an acceptable reliability ($\alpha = .764$). Table 2 presents the final pattern matrix.

Table 2
Pattern Matrix for the CUAS-SSF (N = 645)

Variable	Factor 1	Factor 2
CUAS – SSF		
1. Los condones son incómodos.	.500	
2. Me da vergüenza que me vean comprando condones.	.565	
3. No es necesario el condón al estar Seguro de que la otra persona no tiene una enfermedad sexual.		.604
4. Los condones arruinan el deseo.	.776	
5. Yo no uso condón cuando mi pareja se rehúsa a usarlo.		.458
6. Los condones interrumpen la erección.	.665	
7. Cuando uno tiene una pareja de mucho tiempo, no es necesario usar condón.		.712

For the CFA, we hypothesized a two correlated factor model with four items (i.e., items 1, 2, 4, and 6) loading on the first factor and three items (i.e., items 3, 5, and 8) loading on the second factor. The model yielded a $\chi^2(13) = 50.190$, $p < .001$; GFI = .980, CFI = .962, TLI = .939; RMSEA = .065, and SRMR = .0342. Therefore, all of these values met the *a priori* specified values which indicate adequate fit. Additionally, the results indicated that both Factor 1 (i.e., items 1, 2, 4, and 6) and Factor 2 (i.e., items 3, 5, and 8) regression weights were all significant ($p < .001$) with beta values that ranged between $\beta = .39$ to $.81$ and $\beta = .56$ to $.60$, respectively. Factor 1 and Factor 2 were significantly ($p < .001$) correlated with a covariance weight of .74. The parameter estimates are represented in Fig. 1.

Condom Use Social Norms – Spanish Short Form (CUSN – SSF). The Kaiser-Meyer-Olkin method (.720) and the Bartlett sphericity test ($p < .001$) [44] indicated that the overall sample fit and size were satisfactory. Inspection of eigenvalues and the scree plot, and assessment of the interpretability of the pattern loadings and simple structure revealed a two-factor scale which explained approximately 30% of

the variance. All items loaded onto the two factors with loadings above .32 and no cross-loadings which is indicative of a simple structure and good interpretability of the pattern loadings. Items 1, 2, 5, 6, and 7 loaded onto Factor 1 while items 3 and 4 loaded onto Factor 2. The factor correlation matrix indicated a small yet meaningful correlation between the two factors (.249). Unfortunately, estimates of reliability indicated that the scale had poor reliability ($\alpha = .501$). Due to the low reliability of the scale and that one of its factors was composed of two items, a second exploratory factor analysis was conducted without items 3 and 4. Kaiser's Rule, the scree plot, and the interpretability of the pattern loadings indicated only one factor with all five items having above a .32 factor loading and approximately 31% of the variance was explained. Furthermore, reliability for the five-item scale increase to $\alpha = .674$ which is considered adequate for an exploratory measure [55]. The pattern matrix for the CUSN-SSF is depicted in Table 3.

Table 3
Pattern Matrix for the CUSN-SSF (N = 645)

Variable	Factor	Factor
	1	2
CUSN – SSF		
1. Mi o mis parejas sexuales prefieren que usemos condones cuando témenos relaciones sexuales.	.401	
2. Mis amigos(as) siempre usan condones cuando tienen relaciones sexuales.	.558	
3. La mayoría de mis amigos(as) piensan que usar condones en mucho problema.		.454
4. Mis amigos(as) creen que insistir en usar condón significa que uno NO confía en la pareja.		.563
5. Mis amigos(as) aceptan por complete el uso de condón.	.646	
6. El VIH-SIDA ha hecho que mis amigos(as) sean mas cuidadosos(as) al elegir con quien van a tener sexo.	.655	
7. Mis amigos(as) creen que tener un menor número de parejas sexuales es importante.	.474	

The CFA of the five-item (i.e., items 1, 2, 5, 6, and 7) CUSN-SSF indicated satisfactory fit: GFI = .977; CFI = .916; TLI = .832; RMSEA = .099; and SRMR = .0482. Additionally, all items loaded significantly and in the expected direction onto the factor with regression weights were all significant ($p < .001$) with beta values that ranged between $\beta = .39$ to .74. All parameter estimates are depicted in Fig. 2.

Condom Use Self-Efficacy – Spanish Short Form. Kaiser's rule and the scree plot suggested one factor which accounted for approximately 80% of the variance. However, the pattern matrix was unable to be interpreted due to the presence of a Heywood case (i.e., item 2). A Heywood case indicates an improper solution which may be the result of highly correlated items or items that have zero or negative variances [56]. Subsequently, we inspected the inter-item correlational matrix to assess for multicollinearity which

revealed a very high correlation between items 5 and 6 ($r = .88$). Simulation studies have examined the impact that multicollinearity has on Type II error and found that these errors can be mitigated by high measure reliability, a large amount of variance, and large sample size [57]. Consequently, item 6 was dropped and a second EFA was conducted. In the second iteration, the KMO method (.723) and the Barlett sphericity test ($p < .001$) both suggested that the sample fit and size were satisfactory. The Kaiser Rule, scree plot, and pattern matrix all indicated a two-factor structure which explained approximately 80% of the variance. The pattern matrix revealed a simple structure with interpretability of the factor loadings. Items 3, 4, and 5 loaded onto Factor 1 while items 1 and 2 loaded onto Factor 2. The factor correlation matrix indicated a significant correlation between the two factors ($\alpha = .399$). Lastly, Cronbach's alpha indicated an acceptable reliability ($\alpha = .844$). Tables 2 and 3 present item-correlations and descriptive statistics (e.g., M , SD). The pattern matrix for the CUSE-SSF is depicted in Table 4.

Table 4
Pattern Matrix for the CUSE – SSF items (N = 645)

Variable	Factor 1	Factor 2
1. Confío en mí, en que hablare con mi pareja sexual acerca del VIH/SIDA aunque este bajo la influencia del crack.		.974
2. Confío en mí, en que hablare con mi pareja sexual acerca del VIH/SIDA aunque la persona con quien este teniendo sexo este en desacuerdo.		.782
3. Confío en mí en que usare condón la próxima vez que tenga sexo aunque este bajo la influencia de crack.	.908	
4. Confío en mí en que usare condón la próxima vez que tenga sexo aunque la persona con quien este teniendo sex este en desacuerdo.	.940	
5. Confío en mí en que insistiré en usar condón estando en el calor del momento aunque este bajo la influencia de crack.	.831	

Per the results of the EFA, we tested a two-factor correlated CFA on the CUSE-SSF. The model fit indices for this first model indicated adequate fit: $GFI = .990$; $CFI = .994$; $TLI = .986$; $RMSEA = .071$; and $SRMR = .0170$. Subsequently no modifications were made. Additionally, the results indicated that both Factor 1 (i.e., items, 3, 4, and 5) and Factor 2 (i.e., items 1 and 2) regression weights were all significant ($p < .001$) with beta values that ranged between $\beta = .85$ to $.92$ and $\beta = .87$ to $.92$, respectively. Factor 1 and Factor 2 were significantly ($p < .001$) correlated with a covariance weight of $.45$. Parameter estimate results are shown in Fig. 3.

To test the construct validity of the measures, bivariate correlations were computed between the scales and self-reported condom use in the last 30 days to determine convergent validity. The correlation matrix revealed that all the measures were significantly correlated with one another in the expected direction with small yet meaningful values. As higher scores of the Condom Use Attitudes Scale – Spanish Short Form indicate more negative attitudes towards condoms, this scale had negative correlations with both Condom Use Social Norm – Spanish Short Form ($r = -.09$, $p = .002$) and Condom Use Self-Efficacy – Spanish Short Form ($-.24$, $p < .001$). Higher scores on both the Condom Use Social Norm – Spanish Short Form and Condom Use Self-Efficacy indicate more positive attitudes towards condom use. Consequently, these two scales were positively correlated ($r = .18$). Lastly, analysis revealed that all scales were significantly correlated with self-reported lack or inconsistent use of condoms in the last 30 days (i.e., $CUS - SSF$, $r = .168$, $p < .001$; $CUSN - SSF$, $r = -.09$, $p = .001$; $CUSE - SSF$, $r = -.08$, $p = .003$).

Discussion

Researchers are increasingly culturally adapting, implementing, and testing interventions in Latin American countries heavily impacted by a high prevalence of behaviors that place individuals at risk for HIV such as substance abuse. Multiple pockets of key populations are disproportionately impacted by high rates of HIV/STDs in Central American countries like El Salvador. Although measures are consistently employed to assess reduction in sexual risk behaviors and change in beliefs and attitudes, very few measures have been validated on populations that are most at risk for acquiring HIV and other STDs, such as people who use drugs. Furthermore, even fewer measures have been validated into other non-English languages even though HIV and STDs continue to disproportionately impact other countries.

The purpose of our study was to evaluate the construct validity and psychometric properties of three brief measures of condom use attitudes, social norms, and self-efficacy using exploratory and confirmatory factor analyses and correlational analyses to assess convergent validity. Our results indicate that an 8-item condom attitudes scale and a 5-item condom use self-efficacy scales are brief reliable and valid measures that can be employed to assess factors associated with condom use in Spanish speaking PWUDs. The psychometric properties of non-abbreviated transcultural versions of the UCLA MCAS have been successfully replicated with negligible issues among non-substance users [58–59]. Psychometric validation studies that utilized confirmatory factor analysis also found that the translated measures had a five-factor model using a confirmatory factor analysis and found comparable results (CFI = .935) to the original study (CFI = .90) [60]. In one study, researchers evaluated the structure of the 26-item Echelle Multidimensionnelle des Attitudes Relatives à l'Utilisation du Préservatif (French version of the MCAS) on a sample of 410 female and 354 male undergraduates. The confirmatory factor analyses replicated the five-factor structure in a sample of men and women (CFI = .927 for both) [58]. Overall, these replications indicated that the MCAS continues to be relevant despite possible cultural shifts in sexual attitudes and behaviors. Notably, our analysis of the *CUAS – SSF* revealed fit index values that were better than both the original UCLA MCAS and the transcultural versions of the scale.

Regarding results for the condom use self-efficacy scale, our findings are less compelling. EFAs revealed a two-factor structure yet low reliability and the CFA yielded inconsistent indices of fit in at least two measures which indicates a moderate fit at best. As post-hoc analyses we inspected modification indices which suggested that correlating residuals would improve model fit. A justification could be made for correlating residuals as all items began with the stem: “Confio en mi que...” (“I have confidence in...”). However, correlating residuals is not considered best standard practice so we did not proceed with testing a model with correlated residuals.

Limitations and Implications for Future Research

Our study has several limitations including a potential threat to external validity as our sample only includes non-injection crack users. Consequently, findings from this study may only generalize to individuals who use crack/cocaine and not to injection drug users. Furthermore, we employed a mono-

method as most of the data was collected via self-report. Lastly, future researchers could identify additional items for the condom use self-efficacy measure, especially as one of the factors is a two-item structure. A two-item factor tends to be unstable and ill-defined thus leading to potential methodological issues.

Conclusion

Our results provide evidence that people who use substances can provide reliable answers. Before the present study most measures that have been validated on PWUDs have been measures that assess drug use [61]. Our validated measures are among the first measures validated on PWUDs that are not about drug use which provide further evidence that PWUDs can reliably self-report. Our study represents a significant contribution to the fields of infectious disease and substance use as they fill an important gap in current research, namely the lack of measures that have been validated on both Spanish-speaking individuals and people who use substances.

Abbreviations

CUAS-SSF

Condom Use Attitudes Scale–Spanish Short Form

CUSN-SSF

Condom Use Social Norms–Spanish Short Form

CUSE-SSF

Condom Use Self-Efficacy–Spanish Short Form

HIV

Human Immunodeficiency Virus

AIDS

Acquired Immunodeficiency Syndrome

STD

Sexually Transmitted Disease

PWUD

People Who Use Drugs

MSM

Men-Who-Have-Sex-With-Men

EFA

Exploratory Factor Analysis

CFA

Confirmatory Factor Analysis

KMO

Kaiser-Meyer-Olkin

ML

Maximum Likelihood

CFI
Comparative Fit Index
TLI
Tucker-Lewis model Index
GFI
Goodness of Fit Index
SRMR
Standardized Root Mean Square Residual
RMSEA
Root Mean Square Error of Approximation
RDS
Respondent Driven Sampling

Declarations

Ethics Approval and Consent to Participate

The Medical College of Wisconsin IRB approved the study on April 18, 2011. All participants invited to participate in the study received information about the purpose of the study, that participation was voluntary, study procedures (e.g., nature of questions being asked, approximate time to completion), contact information, and potential risks and benefits of participating prior to consent. Participants provided consent by signing and dating the informed consent sheet.

Consent for Publication

Not Applicable

Availability of Data and Material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SB searched for relevant literature, conducted statistical analysis, and wrote the manuscript. JD was the PI of the funding grant, oversaw data collection, and contributed to writing and editing. JL conducted data collection and helped with analysis and manuscript writing. CL helped with data analysis and manuscript writing.

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References

1. Joint United Nations Programme on HIV/AIDS (UNAIDS). UNAIDS DATA 2018. [Online]. Available from: https://www.unaids.org/sites/default/files/media_asset/unaids-data-2018_en.pdf [Accessed 10/17/18].
2. Shao Y, Williamson C. The HIV-1 epidemic: low- to middle-income countries. *Cold Spring Harbor Perspect Med.* 2012;2(3):a007187.
3. Baral S, Beyrer C, Muessig K, Poteat T, Wirtz AL, Decker MR, Sherman SG, Kerrigan D. Burden of HIV among female sex workers in low-income and middle-income countries: a systematic review and meta-analysis. *The Lancet infectious diseases.* 2012 Jul 1;12(7):538 – 49.
4. Baral SD, Poteat T, Strömdahl S, Wirtz AL, Guadamuz TE, Beyrer C. Worldwide burden of HIV in transgender women: a systematic review and meta-analysis. *The Lancet infectious diseases.* 2013 Mar 1;13(3):214 – 22.
5. Garcia PJ, Benzaken AS, Galban E. STI management and control in Latin America: where do we stand and where do we go from here?. *Sex Transm Infect.* 2011 Dec 1;87(Suppl 2):ii7-9.
6. Miller WM, Buckingham L, Sánchez-Domínguez MS, Morales-Miranda S, Paz-Bailey G. Systematic review of HIV prevalence studies among key populations in Latin America and the Caribbean. *Salud pública de México.* 2013;55:65–78.
7. Mathers BM, Degenhardt L, Phillips B, Wiessing L, Hickman M, Strathdee SA, Wodak A, Panda S, Tyndall M, Toufik A, Mattick RP. Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review. *The Lancet.* 2008 Nov 15;372(9651):1733–45.
8. United Nations Office on Drugs and Crime (UNODC). *Global Study on Homicide: Trends, Context, Data.* Vienna: UNODC

- Nunes ED. United Nations Office on Drugs and Crime (UNODC). Global Study on Homicide: Trends, Context, Data. Vienna: UNODC; 2011. *Ciência. & Saúde Coletiva*. 2012;17:3447-9.
9. Dormitzer CM, Gonzalez GB, Penna M, Bejarano J, Obando P, Sanchez M, Vittetoe K, Gutierrez U, Alfaro J, Meneses G, Bolivar Diaz J. The PACARDO research project: youthful drug involvement in Central America and the Dominican Republic. *Revista panamericana de salud pública*. 2004;15:400–16.
 10. Carr D, Bodnar G, Guevara A, Rodriguez K, Guevara R. Estudio Nacional: Prevalencia del consume de sustancias psicoactivas en El Salvador. San Salvador: Fundacion Antidrogas de El Salvador; 2004.
 11. World Health Organization (WHO). El Salvador. [Online]. Available from: https://www.who.int/hiv/HIVCP_SLV.pdf [Accessed 10/20/18].
 12. Andrinopoulos K, Hembling J, Guardado ME, de Maria Hernández F, Nieto AI, Melendez G. Evidence of the negative effect of sexual minority stigma on HIV testing among MSM and transgender women in San Salvador, El Salvador. *AIDS and Behavior*. 2015 Jan 1;19(1):60–71.
 13. Miller WM, Buckingham L, Sánchez-Domínguez MS, Morales-Miranda S, Paz-Bailey G. Systematic review of HIV prevalence studies among key populations in Latin America and the Caribbean. *Salud pública de México*. 2013;55:65–78.
 14. Ministerio de salud, programa nacional de ITS/VIH/SIDA. Informe nacional de progreso en la lucha contra el SIDA. [Online]. Available from: https://www.unaids.org/sites/default/files/country/documents/SLV_narrative_report_2014.pdf [Accessed 9/28/18].
 15. Joint united nations programme on HIV/AIDS (UNAIDS). Country: El Salvador. [Online]. Available from: <https://www.unaids.org/en/regionscountries/countries/elsalvador> [Accessed 10/15/18].
 16. Dickson-Gomez J, Lechuga J, Glasman L, Pinkerton S, Bodnar G, Klein P. Prevalence and incidence of HIV and sexual risk behaviors in crack users in the San Salvador Metropolitan Area, El Salvador. *World Journal of AIDS*. 2013 Dec;2(04):357. 3(.
 17. Boyle K, Anglin MD. to the curb": sex bartering and drug use among homeless crack users in Los Angeles. In: *Crack pipe as pimp: an ethnographic investigation of sex-for-crack exchanges*. New York: Lexington Books; 1993. pp. 159–86.
 18. Khan MR, Berger A, Hemberg J, O'Neill A, Dyer TP, Smyrk K. Non-injection and injection drug use and STI/HIV risk in the United States: the degree to which sexual risk behaviors versus sex with an STI-infected partner account for infection transmission among drug users. *AIDS and Behavior*. 2013 Mar 1;17(3):1185-94.
 19. Lejuez CW, Bornoalova MA, Daughters SB, Curtin JJ. Differences in impulsivity and sexual risk behavior among inner-city crack/cocaine users and heroin users. *Drug and alcohol dependence*. 2005 Feb 14;77(2):169–75.
 20. Dickson-Gomez J, Bodnar G, Petroll A, Johnson K, Glasman L. HIV treatment for alcohol and non-injection drug users in El Salvador. *Qual Health Res*. 2015 Dec;25(12):1719–32.

21. Duff P, Tyndall M, Buxton J, Zhang R, Kerr T, Shannon K. Sex-for-Crack exchanges: associations with risky sexual and drug use niches in an urban Canadian city. *Harm reduction journal*. 2013 Dec;10(1):29.
22. Shannon K, Strathdee SA, Shoveller J, Rusch M, Kerr T, Tyndall MW. Structural and environmental barriers to condom use negotiation with clients among female sex workers: implications for HIV-prevention strategies and policy. *American journal of public health*. 2009 Apr;99(4):659–65.
23. Fonner VA, Kennedy CE, O'Reilly KR, Sweat MD. Systematic assessment of condom use measurement in evaluation of HIV prevention interventions: need for standardization of measures. *AIDS and Behavior*. 2014 Dec 1;18(12):2374-86.
24. Mukandavire Z, Mitchell KM, Vickerman P. Comparing the impact of increasing condom use or HIV pre-exposure prophylaxis (PrEP) use among female sex workers. *Epidemics*. 2016 Mar 1;14:62–70.
25. Center for disease control and prevention. Condom fact sheet in brief. [Online]. Available from: <https://www.cdc.gov/condomeffectiveness/docs/condomfactsheetinbrief.pdf> [Accessed 11/3/18].
26. Pinkerton SD, Abramson PR. Effectiveness of condoms in preventing HIV transmission. *Social science & medicine*. 1997 May 1;44(9):1303-12.
27. Reece M, Herbenick D, Hollub AV, Hensel DJ, Middlestadt SE. A psychometric assessment of the multi-factor attitude toward condoms scale (MFACS). *International Journal of Sexual Health*. 2010 May 20;22(2):119–29.
28. Weller SC, Davis-Beaty K. Condom effectiveness in reducing heterosexual HIV transmission. *Cochrane database of systematic reviews*. 2002(1).
29. World Health Organization (WHO). Position statement: condoms and HIV prevention. [Online]. Available from: https://www.who.int/hiv/pub/condoms/20090318_position_condoms.pdf?ua=1 [Accessed 9/28/18].
30. Basen-Engquist K, Parcel GS. Attitudes, norms, and self-efficacy: A model of adolescents' HIV-related sexual risk behavior. *Health Educ Q*. 1992 Jul;19(2):263–77.
31. Basen-Engquist K, Masse LC, Coyle K, Kirby D, Parcel GS, Banspach S, Nodora J. Validity of scales measuring the psychosocial determinants of HIV/STD-related risk behavior in adolescents. *Health education research*. 1999 Feb 1;14(1):25–38.
32. HIV/AIDS Prevention Research Synthesis Team
Crepaz N, Horn AK, Rama SM, Griffin T, Deluca JB, Mullins MM, Aral SO. HIV/AIDS Prevention Research Synthesis Team. The efficacy of behavioral interventions in reducing HIV risk sex behaviors and incident sexually transmitted disease in black and Hispanic sexually transmitted disease clinic patients in the United States: a meta-analytic review. *Sexually transmitted diseases*. 2007 Jun 1;34(6):319 – 32.
33. Institute of Medicine, Committee on Envisioning a Strategy for the Long-Term Burden of HIV/AIDS. African Needs and US Interests. Preparing for the future of HIV/AIDS in Africa: a shared responsibility. National Academies Press; 2010.

34. Rotheram-Borus MJ, Swendeman D, Chovnick G. The past, present, and future of HIV prevention: integrating behavioral, biomedical, and structural intervention strategies for the next generation of HIV prevention. *Annual review of clinical psychology*. 2009 Apr 27;5:143–67.
35. Saucedo JA, Brooks RA, Xavier J, Maiorana A, Gomez LG, Zamudio-Haas S, Rodriguez-Diaz CE, Cajina A, Myers J. From theory to application: A description of transnationalism in culturally-appropriate HIV interventions of outreach, access, and retention among Latino/a populations. *Journal of immigrant and minority health*. 2019 Apr 15;21(2):332 – 45.
36. Arnett JJ. The neglected 95%: why American psychology needs to become less American. *American Psychologist*. 2008 Oct;63(7):602.
37. Salganik MJ, Heckathorn DD. Sampling and estimation in hidden populations using respondent-driven sampling. *Sociological methodology*. 2004 Dec;34(1):193–240.
38. Dickson-Gomez J, Tarima S, Glasman LR, Lechuga J, Bodnar G, de Mendoza LR. Intervention Reach and Sexual Risk Reduction of a Multi-level, Community-Based HIV Prevention Intervention for Crack Users in San Salvador, El Salvador. *AIDS Behav*. 2019 May;15(5):1147–57. 23(.
39. Dilorio C, Maibach E, O'Leary A, Sanderson CA, Celantano D. Measurement of condom use self-efficacy and outcome expectancies in a geographically diverse group of STD patients. *AIDS Education and Prevention*. 1997 Feb;9(1).
40. Sikkema KJ, Heckman TG, Kelly JA, Anderson ES, Winett RA, Solomon LJ, Wagstaff DA, Roffman RA, Perry MJ, Cargill V, Crumble DA. HIV risk behaviors among women living in low-income, inner-city housing developments. *American journal of public health*. 1996 Aug;86(8_Pt_1):1123–8.
41. Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*. 1988 May;103(3):411.
42. Rubin LH, Witkiewitz K, Andre JS, Reilly S. Methods for handling missing data in the behavioral neurosciences: Don't throw the baby rat out with the bath water. *Journal of Undergraduate Neuroscience Education*. 2007;5(2):A71.
43. Lomax RG. *An introduction to statistical concepts for education and behavioral sciences*. 2nd ed. New Jersey: Lawrence Erlbaum Associates Publishers; 2001.
44. Tabachnick BG, Fidell LS, Ullman JB. *Using multivariate statistics*. Boston: Pearson; 2007. Mar 3.
45. Kaiser HF, Rice J. Little jiffy, mark IV. *Educational and psychological measurement*. 1974 Apr;34(1):111–7.
46. Gorsuch RL. *Factor Analysis*. 2nd ed. New Jersey: Lawrence Erlbaum Associates Publishers; 1983.
47. Pituch KA, Stevens JP. *Applied multivariate statistics for the social sciences: Analyses with SAS and IBM's SPSS*. Routledge; 2015 Dec 7.
48. Kaiser HF. The application of electronic computers to factor analysis. *Educational and psychological measurement*. 1960 Apr;20(1):141–51.
49. Thurstone LL. *Multiple factor analysis*. Illinois: University of Chicago Press; 1947.

50. Costello AB, Osborne J. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical assessment research evaluation*. 2005;10(1):7.
51. Fabrigar LR, Wegener DT, MacCallum RC, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. *Psychol Methods*. 1999 Sep;4(3):272.
52. Cudeck R, O'Dell LL. Applications of standard error estimates in unrestricted factor analysis: Significance tests for factor loadings and correlations. *Psychological bulletin*. 1994 May;115(3):475.
53. Bentler PM, Bonett DG. Significance tests and goodness of fit in the analysis of covariance structures. *Psychological bulletin*. 1980 Nov;88(3):588.
54. Browne MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, Long JS, editors. *Testing structural equation models*. California: Sage; 1993. pp. 136–62.
55. Nunnally JC, Bernstein IH. *Psychometric theory*. 3rd ed. New York: McGraw-Hill; 1994.
56. Chen F, Bollen KA, Paxton P, Curran PJ, Kirby JB. Improper solutions in structural equation models: Causes, consequences, and strategies. *Sociological methods & research*. 2001 May;29(4):468–508.
57. Grewal R, Cote JA, Baumgartner H. Multicollinearity and measurement error in structural equation models: Implications for theory testing. *Marketing science*. 2004 Nov;23(4):519–29.
58. Chantal Y, Recorbet R, Ferland F, Fontaine D. Towards a multidimensional analysis of attitudes about condom use: A trans-cultural validation of the UCLA-MCAS. *European Review of Applied Psychology*. 2000;50(4):393–403.
59. Unger JB, Molina GB. The UCLA multidimensional condom attitudes scale: Validity in a sample of low-aculturated Hispanic women. *Hispanic Journal of Behavioral Sciences*. 1999 May;21(2):199–211.
60. Helweg-Larsen M, Collins BE. The UCLA multidimensional condom attitudes scale: documenting the complex determinants of condom use in college students. *Health Psychol*. 1994 May;13(3):224.
61. Napper LE, Fisher DG, Johnson ME, Wood MM. The reliability and validity of drug users' self reports of amphetamine use among primarily heroin and cocaine users. *Addictive behaviors*. 2010 Apr 1;35(4):350-4.

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